ORDER NO. 5932

UNITED STATES OF AMERICA
POSTAL REGULATORY COMMISSION
WASHINGTON, DC 20268-0001

Before Commissioners: Michael Kubayanda, Chairman;
Ashley E. Poling, Vice Chairwoman;
Mark Acton;
Ann C. Fisher; and
Robert G. Taub

Periodic Reporting   Docket No. RM2020-2
(Proposal Ten)

ORDER ON ANALYTICAL PRINCIPLES
USED IN PERIODIC REPORTING (PROPOSAL TEN)

(Issued July 8, 2021)

I.   INTRODUCTION

On November 29, 2019, the Postal Service filed a petition pursuant to 39 C.F.R. § 3050.11 requesting the Commission initiate a rulemaking proceeding to consider changes to analytical principles relating to the Postal Service's periodic reports.[1] The Petition identifies the proposed analytical methodology changes filed in this docket as Proposal Ten. Proposal Ten seeks to update and improve the variabilities for calculating attributable Postmaster costs based on a new study of Postmaster costs

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[1] Petition of the United States Postal Service for the Initiation of a Proceeding to Consider Proposed Changes in Analytical Principles (Proposal Ten), November 29, 2019 (Petition). The Postal Service filed a notice of filing of non-public materials relating to Proposal Ten. Notice of Filing of USPS-RM2020-2/1 and USPS-RM2020-2/NP1 and Application for Nonpublic Treatment, November 29, 2019.

"that relies upon operational Postmaster data and reflects the current structure of Postmaster activities and compensation."[2]

After review, the Commission rejects Proposal Ten for the following reasons. First, there are significant issues with the Postal Service's choice of the percentage change in Workload Service Credits (WSCs), used to perform the second classification of Post Offices and the corresponding percentage change in the cost. Second, the Postal Service has failed to demonstrate the robustness of the variability used with respect to the assumed change in WSCs. Third, the Postal Service did not use clear criteria in its sensitivity analysis that can be relied upon to choose the scaling factor used to implement changes in WSCs. Finally, the unidirectional nature of the proposed variability is problematic. Each of these issues is discussed in detail below.

II.   PROCEDURAL HISTORY

The Postal Service filed its Petition and accompanying information on November 29, 2019. On December 4, 2019, the Commission issued a notice establishing Docket No. RM2020-2, appointing a Public Representative, and providing interested persons with an opportunity to comment.[3]

The Public Representative filed two motions for issuance of information requests.[4] Upon consideration of those motions, some related questions were included

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[2] Petition, Proposal Ten at 1. The Postal Service's Petition was accompanied by a study supporting its proposal. *See* Michael D. Bradley (Bradley), *Investigating the Variability of Postmaster Costs,* November 29, 2019 (Bradley Study).

[3] Notice of Proposed Rulemaking on Analytical Principles Used in Periodic Reporting (Proposal Ten), December 4, 2019 (Order No. 5336).

[4] *See* Public Representative Motion for Issuance of Information Request 1, December 12, 2019; *see also* Public Representative Motion for Issuance of Information Request 2, December 23, 2019.

in Chairman's Information Request (CHIR) Nos. 1 and 2.[5] Three additional CHIRs were subsequently issued.[6] The Postal Service filed responses to each of the five CHIRs.[7]

On February 28, 2020, the Public Representative filed comments.[8] On March 9, 2020, the Postal Service filed reply comments.[9]

III. BACKGROUND

Postmasters are compensated through the WSC system under which Executive Administrative Schedule (EAS) pay grades are determined by credits earned. Petition, Proposal Ten at 1. These credits are earned in various ways, such as by the amount of

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[5] *See* Chairman's Information Request No. 1, December 19, 2019 (CHIR No. 1); Chairman's Information Request No. 2, January 17, 2020 (CHIR No. 2).

[6] *See* Chairman's Information Request No. 3, March 5, 2020 (CHIR No. 3); Chairman's Information Request No. 4, June 26, 2020; Chairman's Information Request No. 5 (CHIR No. 5), July 23, 2020.

[7] *See* Responses of the United States Postal Service to Questions 1-5 of Chairman's Information Request No. 1, January 2, 2020 (Response to CHIR No.1); Responses of the United States Postal Service to Questions 1-7 of Chairman's Information Request No. 2, January 29, 2020 (Response to CHIR No. 2); Responses of the United States Postal Service to Questions 1-5 of Chairman's Information Request No. 3, March 18, 2020 (Response to CHIR No. 3); Responses of the United States Postal Service to Questions 1-2 of Chairman's Information Request No. 4, July 2, 2020 (Response to CHIR No. 4); Responses of the United States Postal Service to Questions 1-5 of Chairman's Information Request No. 5, August 4, 2020 (Response to CHIR No. 5). Regarding its Response to CHIR No. 5, the Postal Service filed a motion for an extension of time to respond to CHIR No. 5. *See* Motion of the United States Postal Service for Extension of Time to Respond to Chairman's Information Request No. 5, July 24, 2020. That motion was granted. *See* Order Granting Motion for Extension of Time, July 27, 2020 (Order No. 5602). Additionally, the Postal Service filed a notice of filing of public materials relating to Response to CHIR No. 3 and Response to CHIR No. 4. *See* Notice of Filing of USPS-RM2020-2/2, March 18, 2020; Notice of Filing of USPS-RM2020-2-3, July 2, 2020.

[8] Public Representative Comments on Proposed Change in Analytical Principles Used in Periodic Reporting, February, 28, 2020 (PR Comments). The Public Representative also filed a notice of filing of a public library reference relating to Proposal Ten. *See* Notice of Filing of PR-LR-RM2020-2/1, February 28, 2020.

[9] Reply Comments of the United States Postal Service Regarding Proposal Ten, March 9, 2020 (Postal Service Reply Comments). Concurrently, the Postal Service filed a motion for leave to file reply comments. *See* Motion of the United States Postal Service for Leave to File Reply Comments Regarding Proposal Ten, March 9, 2020. That motion is granted. The Postal Service Reply Comments were accompanied by an evaluation by Michael D. Bradley of the Public Representative's comments. *See* Michael D. Bradley, *Evaluation of Comments Filed by the Public Representative in Docket No. RM2020-2,* March 9, 2020 (Bradley Evaluation).

revenue flowing through a post office and for performing non-revenue activities like servicing post office boxes and performing administrative functions. *Id.*

The costs of Postmaster compensation are currently attributed to products based on the regression analysis presented in Docket No. R84-1, which measures the variability between WSCs and Postmaster costs. *Id.* The result is a single variability being applied to accrued Postmaster compensation costs. *Id.* at 6. However, this variability is based on only 10 data points because there was a lack of available data on WSCs for individual post offices at the time the proceedings in Docket No. R84-1 were conducted. *Id.* at 3. The Postal Service states that an investigation into Postmaster compensation costs is necessary given the amount of time that has passed since the proceedings in Docket No. R84-1 were concluded. *Id.* at 1-2.

The Postal Service notes three major changes that have occurred since Docket No. R84-1 was completed. *Id.* at 2. First, the Postmaster compensation structure was changed as a result of the Post Office Structure Plan (POStPlan), and post offices that were in EAS grades below EAS-18 are no longer part of the EAS pay grade system. *Id.* Second, the EAS-18 pay grade has been split into two pay grades—EAS-18 and EAS-18B. *Id.* Finally, the Postmaster salary scale, which describes the base salary for a Postmaster at each pay grade, has been updated with the most recent salary schedule established in January 2019. *Id.*

In addition, the Postal Service notes that it now routinely collects data on Postmaster workload for operational purposes, providing "an excellent opportunity for updating and improving the Postmaster variability." *Id.* at 3. These additional data "contain both the EAS grade and current WSCs for the Postmasters in the EAS system," which covers over 13,000 offices. *Id.*

IV.   PROPOSAL TEN

Proposal Ten seeks to update and improve the variabilities for calculating attributable Postmaster costs based on a new study of Postmaster costs "that relies

upon operational Postmaster data and reflects the current structure of Postmaster activities and compensation." *Id.* at 1. The methodology proposed by the Postal Service for the computation of Postmaster compensation volume variability combines the shift in the number of Postmasters from one EAS grade to the next with changes in the resulting total minimum Postmaster salary. *Id.* at 3-5. Thus, the value for Postmaster compensation volume variability comes from two sources: (1) the percentage change in the number of Postmasters moving from one grade to the next; and (2) the percentage increase in the minimum salary across the two EAS grades. *See id.* at 5, Table 1 (and accompanying text).

The Postal Service's proposed methodology to determine Postmaster attributable costs follows several steps. Bradley Study at 23 (Section A. Estimating the Core EAS Models), *id.* at 33 (Section B. Investigating an EAS-24 Model), and *id.* at 34 (Section C. Estimating the EAS-18 to EAS-18B Model).

These steps are applied to EAS grade pairs (18-18B; 18B-20; 20-21; 21-22; 22-24; 24-26). First, for each EAS grade pair, the probability of a Postmaster moving from the lower EAS grade, *i.e.*, the grade with lower Postmaster minimum salary, to the higher EAS grade, *i.e.*, the grade with higher Postmaster minimum salary is estimated, using a logistic regression.[10] Second, for each EAS grade pair, the total minimum Postmaster salary in the lower grade is computed through the classification of Postmasters based on the estimated probabilities determined as part of step one. Third, all WSCs in the lower grade of each EAS grade pair are scaled up, uniformly, by

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[10] In the logistic regression, the outcomes are binary and coded as 1 or 0. The value 1 is assigned to each Postmaster in the higher EAS grade of the pair, and 0 is assigned to the Postmaster in the lower EAS grade. The regression function is the probability that the outcomes take the value 1. This probability is specified as a function of a linear combination of WSC and the number 1, which is the sum of a constant term and a linear term in WSC. The particular function used in the specification is the logistic function, also referred to as the sigmoid function. In this case, the logistic regression is performed to calculate the estimated probabilities that are used in the classification of Post Offices. *See id.* at 18-20.

a chosen percentage (for example, by 10 percent).[11] The probabilities from step one are recalculated and the newly calculated probabilities are used to classify, once again, Postmasters in the lower grade of each EAS grade pair. This classification leads to a new total minimum Postmaster salary in the lower grade of each EAS grade pair. Fourth, for each EAS grade pair, the percentage change in total minimum Postmaster salary in the lower grade from step two to step three is calculated and divided by the chosen percentage change in WSCs (10 percent). Step four results in an estimated variability for the lower EAS grade in each EAS grade pair. Finally, the variability for each EAS grade is applied to the accrued cost for each EAS grade, resulting in volume-variable costs for each grade.

The grade-level volume-variable costs are summed to get the total volume-variable costs for Postmaster compensation. The overall volume variability is obtained as the weighted average of the grade-specific variabilities, where the weight corresponding to a grade is its share in the combined total minimum Postmaster salary for all the grades involved in the average.

The Postal Service states that the proposed approach results in lower volume variability for Postmaster compensation costs for three reasons. Petition, Proposal Ten at 6. First, the volume variability of Docket No. R84-1 was "overstated due to a computational error" and correcting the error reduces the volume variability to 13 percent. *Id.*

Second, the Postal Services notes that the POStPlan eliminated lower EAS grades, in which Postmasters had been able to move to the next higher grade-level and obtain salary increases more rapidly.[12] As mail volume increases, additional WSCs are

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[11] The 10 percent scale up percentage is referred to by the Postal Service as θ. As discussed below, several percentage increases were considered before a final decision was made to scale up the WSCs by 10 percent.

[12] *Id*. The POStPlan changed the hours at smaller post offices and changed the Postmaster compensation structure. *Id.* at 2. As noted above, following the implementation of the POStPlan, post offices that were in the EAS grades below EAS-18 are no longer in the EAS system. *Id.*

earned, possibly resulting in EAS grade changes and salary increases that, in turn, produce increased Postmaster compensation costs. In the higher EAS grades, moving to the next grade-level requires much larger increases in WSCs. Thus, increases in WSCs for these higher EAS grades are less likely to cause Postmasters to move up to a higher minimum salary and increase Postmaster compensation costs. *Id.* at 6. Accordingly, a given percentage increase in volume is, under the current structure, less likely to induce an increase in Postmaster compensation costs, which in turn has the effect of creating a lower volume variability. *Id.* at 6-7.

Third, the Postal Service notes that the current approach measures how quickly salaries would rise from an overall increase in WSCs, while, in reality, "each EAS grade has a wide band of WSCs associated with it, and most post offices have a level of WSCs such that typical increases in their WSCs will keep the Postmaster in the same [EAS] grade." *Id.* at 7. The Postal Service states that Proposal Ten would account for the amount of WSCs Postmasters actually earn and how quickly the "existing complement of Postmasters" would move up a grade if WSCs were increased, neither of which are currently measured. *Id.*

The Postal Service acknowledges that reduced volume variability causes a reduction in total volume-variable costs for Postmaster compensation and proportional reductions "per piece by product." *Id.* However, the Postal Service notes that "Postmaster costs per piece are typically quite small" thus "the overall impacts on volume[-]variable costs per piece are generally quite small." *Id.*

V.   COMMENTS

A.   Public Representative Comments

The Public Representative recommends rejection of Proposal Ten and raises three main issues. PR Comments at III-2-III-3.

First, the Public Representative takes issue with the use of WSCs as a measure of Postmaster workload and variability. *Id.* at V-12-V-16. He states that "[b]ecause WSCs are so strongly tainted by measurement and non-sample error," he has "no confidence the Bradley [Study's] estimates of [P]ostmaster variabilities are reasonable." *Id.* at VII-1.

Second, he criticizes the Bradley Study's failure to consider the use of a multicategory logistic regression in predicting the probabilities of Postmasters moving up in EAS grades. *Id.* at IV-8-V-14.

Third, he challenges the use of a single 10 percent WSC growth rate in calculating variabilities, as well as the sensitivity analysis upon which the choice of the 10 percent change in WSCs is based. *Id.* at V-16-V-20. He maintains that even if the data and the use of a binary logistic regression from the Bradley Study was accepted, choosing an annual WSC growth rate of 10 percent "does not withstand scrutiny." *Id.* at VII-1.

B.   Postal Service Reply Comments

The Postal Service asserts that the Public Representative's criticisms "provide no valid basis to reject the proposal;" that his comments "are of little value to the Commission in either evaluating or refining the Postal Service's proposal…[and are]…a set of unsupported assertions that…misunderstand and thus mischaracterize [the] proposal." Postal Service Reply Comments at 1.

In his evaluation accompanying the Postal Service's Reply Comments, Bradley takes issue with the Public Representative's challenge to the use of WSCs as a measure of workload and variability. Bradley Evaluation at 6-10. Bradley also defends the decision not to use a multicategory logistic regression in predicting the probabilities of Postmasters moving up in EAS grades. *Id.* at 13-17. Finally, Bradley defends the use of a single 10 percent WSC growth rate in determining variabilities and the related sensitivity analysis upon which the choice of the 10 percent growth is based. *Id.* at 17-21.

VI.   COMMISSION ANALYSIS

Pursuant to 39 U.S.C. § 3652(e)(2), improvements in the "quality, accuracy, or completeness of Postal Service data required by the Commission" may be initiated or entertained by the Commission if "the attribution of costs or revenues to products has become significantly inaccurate or can be significantly improved," or if "such revisions are, in the judgment of the Commission, otherwise necessitated by the public interest."[13]

The Commission finds that the applicable statutory requirements have not been satisfied. The Postal Service presents Proposal Ten in order to "update and improve the variabilities for calculating attributable Postmaster costs." Petition, Proposal Ten at 1. However, the Postal Service has not shown that the proposed revisions to Postmaster cost variability and attribution would result in a significant improvement in the attribution of costs. Nor is there any indication that the change is necessitated by the public interest.

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[13] 39 U.S.C. § 3652(e)(2)(A), (C). Additional grounds for data improvement occur when "the quality of service data has become significantly inaccurate or can be significantly improved," which is inapplicable here. 39 U.S.C. § 3652(e)(2)(B).

In Section A., the Commission analyzes the Public Representative's concerns regarding the use of WSCs as a measure of Postmaster workload and variability, the Public Representative's critique of the Postal Service's failure to consider a multicategory logistic regression, the Postal Service's use of a single percentage change to determine elasticities and its related sensitivity analysis, and the Postal Service's unidirectional measurement of Postmaster movement. After consideration of these issues, the Commission finds that the Postal Service has failed to demonstrate that Proposal Ten significantly improves the quality, accuracy or completeness of the data. In Section B., the Commission identifies potential modifications and improvements to Proposal Ten that the Postal Service should consider in any future proposal related to the updating of Postmaster attributable costs.

      A.   The Postal Service has failed to demonstrate that the existing methodology can be significantly improved by Proposal Ten or that Proposal Ten is necessitated by the public interest.

            1.   Accuracy of WSCs as a Measure of Workload

The Public Representative takes issue with the Postal Service's use of WSCs as a measure of Postmaster workload. He objects to the Postal Service's failure to respond to the concerns expressed by the Commission in Docket No. 84-1 regarding the use of the WSC index as an accurate and reliable measure of Postmaster workload. PR Comments at I-2, V-14-V-16. He also challenges the failure to update the workload factors and/or the weights underlying the WSC index to reflect current operating conditions. *Id.* at I-2.

The Public Representative notes that WSCs were originally developed by the Expanded Postmaster Criterion System (ECPS) Task Force, which identified nine quantitative factors and five revenue factors of Postmaster workload and combined them into a single index. *Id.* at V-12. In order to do so, the ECPS established weights, based on a consensus evaluation of ECPS field study results, reflecting the relative impact each workload factor had on Postmaster salary. *Id.* at V-12, V-13.

The Public Representative takes the position that using weights to combine the workload factors "severed the direct link between [the] workload factors and the determination of WSC's." *Id.* at V-12. He states further that, in assigning weights to each workload factor, ECPS "predetermined much of the causal relation[ship]" between the combined factors and the WSCs. *Id.* at V-12, V-13. He states that the weights were developed using the "subjective interpretation of the ECPS" and "because WSCs are determined by revenue and workload factors in an unknown and unknowable way…, WSCs mismeasure actual workload, which result[s] in grossly biased variability estimates." *Id.* at V-13 (footnote omitted).

The Public Representative maintains that, aside from "poorly measuring" the available data, "[m]easurement error also exists because those who created the measurement method had a human resource purpose in mind for their creation, thus introducing a tremendous amount of non-sample error." *Id.* n.21.

The Public Representative notes that the Postal Service "took several steps to update WSCs." *Id.* at V-14. Data from over 13,000 post offices, along with changes in EAS grades and minimum salaries, allowed the Postal Service to collect more accurate data. *See generally id.* However, the Public Representative objects to Proposal Ten's continued reliance on the previous estimates of WSCs, which the Public Representative believes contain errors. *Id.* at V-14-V-15. He maintains that because "ECPS did not test the validity or statistical significance of its prior assumption(s) of the causal nature of workload factors and salary, there is a very high probability that WSCs have always been measured in error." *Id.* at V-15. He asserts that Proposal Ten's failure to modify the weights of the workload factors to reflect current operational and economic conditions means that WSCs will continue to be measured in error and are "not an appropriate data source for [P]ostmaster variability estimates." *Id.* at V-15 (footnote omitted).

The Public Representative expresses concern that the Commission's acceptance of Proposal Ten "will establish a precedent" that the current measurement of WSCs using workload factors and their weights are acceptable. *Id.* at V-15-V-16. He recommends that the Commission reject the model proposed by the Bradley Study, initiate a technical conference to discuss the feasibility of using alternate measures of workload to be followed by either a Notice of Public Inquiry or a new rulemaking docket to estimate the variability of Postmaster costs. *Id.* at I-2, III-3.

Bradley disagrees with the Public Representative's discussion of the weighting of Postmaster workload factors used to determine WSCs. He states that the "logic behind weighting workload factors is clear," and that "[i]f a certain activity takes more time or effort, then it should be given a larger weight in calculating workload." Bradley Evaluation at 7. Bradley contends that the Public Representative's understanding of the original measurement of WSCs is "exactly backwards" and that it is "entirely appropriate" for the Postal Service to determine the relative values of various Postmaster activities. *Id.* at 8. As to the Public Representative's point that some of the data may be used for human resource purposes, Bradley maintains this does not disqualify the data from being used as operational data. *Id.* at 10.

Bradley contends that the Public Representative's concerns stemming from Docket No. 84-1 are not relevant in determining the variability of Postmaster costs with respect to changes in WSCs under the current system, which uses revenue to determine WSCs and Postmaster compensation. *Id.* at 9.

Bradley further contends that the Public Representative's comments "exhibit unfamiliarity with the advances in attributable costing methodolog[ies] that have taken place" through rate cases and rulemakings. *Id.* at 10. Bradley interprets the Public Representative's comments as suggesting Postmaster costs return to a functional analysis applicable "in the late 1970s and early 1980s," instead of being based on evolved and improved costing methodologies. *Id.* at 11. Bradley maintains a functional analysis of Postmaster costs would require expensive and time consuming field studies.

Id. at 12. He states that "[g]iven the availability of an electronic data set that covers all post offices in the EAS system and econometric techniques that support capturing the actual relationship between WSCs and Postmaster costs, there is no need to return to older methods." *Id.*

In Order No. 1626, the Commission noted that the current methodology rests upon the assumption that WSCs vary in proportion to volume:

> The estimate of the volume variability of postmaster costs that is currently in use is the output of a 1984 econometric model that uses data collected in FY 1978 and 1979. The model regresses postmaster minimum salaries on the [WSCs] that qualify a postmaster for that minimum salary. This method assumes that the set of [WSCs] that applies to each postmaster varies in proportion to volume.[14]

The Postal Service has itself acknowledged that an issue warranting further research is:

> …whether the relationship between changes in mail volume and changes in the intermediate driver of postmaster labor costs [WSCs] should continue to be assumed to be proportional, or whether that relationship should be empirically modeled.

Order No. 1626 at 8. And the Commission and the Postal Service have agreed "that the assumption that [WSCs] vary in proportion to volume would benefit from more rigorous examination." *See id.* In Order No. 1626, the Commission stated that such a rigorous examination would be suitable for pursuit in the "long term." *See id.*

The positions taken by the Public Representative in this proceeding are consistent with the prior representations by the Postal Service and the views expressed by the Commission in Order No. 1626, namely, that the assumption that WSCs vary in proportion to volume would benefit from more rigorous examination. *See id.* The Commission continues to hold that a more rigorous examination of the assumption that

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[14] Docket No. RM2011-3, *Order Setting Near-Term Priorities and Requesting Related Reports,* January 18, 2013, at 7 (Order No. 1626).

WSCs vary in proportion to volume would be appropriate. In that regard, the Commission notes that the 7 years that have elapsed between the issuance of Order No. 1626 and the filing of this case represent a long enough period of time for the Postal Service to have examined the assumption that WSCs vary in proportion to volume.

In light of its decision to reject Proposal Ten (for the reasons discussed below), at this time the Commission is not adopting the Public Representative's recommendation of a technical conference to consider the feasibility of using alternate measures of workload with the possibility of initiating a public inquiry or rulemaking proceeding. However, should the Postal Service elect to file a further proposal based upon the assumption of proportionality between volume and WSCs (which both the existing methodology and Proposal Ten rely on), it should provide further evidence of the existence and nature of that relationship. In particular, future proposals to update and improve the variabilities for calculating attributable Postmaster costs should demonstrate by means of a more rigorous examination the validity of the assumption that WSCs vary in proportion to volume or explain why such a more rigorous examination is unnecessary.

2.   Lack of Consideration Given to Multicategory Logistic Regression

The Public Representative states that, in using a logistic model to predict probabilities of moving up in EAS grade, the Bradley Study fails to consider the use of a multicategory logistic regression and "whether or not it is more efficient than a weighted average of binary regression results."[15]

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[15] PR Comments at IV-9 (footnote omitted). A binary logistic regression is used to model response variables that can only take one of two possible values at a time. In multicategory logistic regression models, the categorical responses have more than two categories. *See* Alan Agresti, *An Introduction to Categorical Data Analysis,* Second Edition, Wiley, at 173 (2007) (Agresti). Estimators are functions of the data, which are used to estimate the values of the unknown coefficients or parameters of the model. When an estimator produces more precise estimates, *i.e.*, with lower standard errors, of the parameters than another, the first is said to be more efficient than the second. *See* B.S. Everitt & A. Skrondal *The Cambridge Dictionary of Statistics*, Fourth Edition, at 149 (2010).

The Public Representative states further that the Bradley Study does not cite any economic literature supporting the use of a binary logistic regression over a multicategory logistic regression. PR Comments at IV-9. He notes that the Bradley Study rejects the use of a multicategory logistic regression because it appears to assume that use of a multicategory logistic would require constant marginal effects across grades and "grades with wider WSC ranges will have slower response rates than those with [narrower] WSC ranges." *Id.*

The Public Representative indicates that the Bradley Study assumes "EAS grades with wider WSC bands…will require a larger change in WSCs to move [P]ostmasters in that grade to the next higher EAS grade," and that a binary logistic is therefore more appropriate. *Id.* However, he notes that the mathematical presentation of a multicategory logistic "appears to incorporate different log odds ratios, and could therefore be used to model different marginal effects and response rates" for each EAS grade within a single model. *Id.*

Bradley contends that the Public Representative's comments "reflect a basic confusion about polychotomous logistic models," which led to his "erroneous assertion that the set of dichotomous Postmaster logistic models should necessarily be replaced with a single polychotomous model." Bradley Evaluation at 13. Bradley explains that "the type of polychotomous logistic model that should be estimated depends upon whether the dependent variable in the regression is a nominal variable or an ordinal variable."[16] "When the dependent variable in a polychotomous logistic model is nominal, then a multinomial logit model (also called a 'baseline model,' as it is in the Agresti book cited by the Public Representative) should be used. In contrast, when the dependent variable is ordinal, then the relevant polychotomous logistic model is the proportional odds model (also called the 'cumulative logit model,' as in the Agresti

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[16] *Id.* at 13-14. Bradley further explains that a nominal variable is where there is no inherent ordering of the different values for the dependent variable whereas an ordinal variable has an unambiguous ranking of values, from low to high, for the dependent variable. *Id.* at 14.

book)." *Id.* Bradley notes that, because EAS grades are sequential from low to high, there is "an inherent order" in which Postmaster compensation increases with each EAS grade. *Id.*

Bradley contends that, with the type of polychotomous logistic regression suited for ordinal outcomes, only a single coefficient is estimated for each explanatory value. *Id.* Bradley states that the use of such a logistic regression would assume there is a single speed of adjustment in EAS grades to a change in WSCs across all EAS grades. *Id.* at 14-15. Such an assumption would not be appropriate for calculating Postmaster variability because, under the current EAS grade structure, the higher the EAS grade the larger the increases in WSCs required to move up an EAS grade. *Id.* at 15. Bradley maintains that the assumption that only a single coefficient is estimated for each explanatory variable does not hold and the fact that it does not hold can also be seen by examining the estimated transition coefficients from the individual logistic regressions. *Id.* at 15-16.

Bradley also responds to the Public Representative's suggestion that a polychotomous logistic regression would be more efficient. *Id.* at 17. Bradley states that the Public Representative does not "address the implications of relative inefficiency" and does not "provide any indication of how serious this potential problem is" for measuring Postmaster volume variability. *Id.* However, Bradley explains that efficiency is not an issue for the proposed dichotomous logistic regression because the standard error of such a regression is "very small." *Id.*

The Commission begins its analysis in this section by noting that the terminology pertaining to the generalized versions of binary outcome regression models is not standardized. Engel, for example, refers to the methods available for modelling relationships between categorical response variables with more than two categories and

explanatory variables as polytomous logistic regression.[17] Agresti refers to regression models that assume that the counts in the categories of the outcome have a multinomial distribution as multicategory models. Agresti at 173. Among these models, some involve a nominal response, *i.e.*, a categorical response for which the categories are treated as unordered. When these models are based on the logistic or sigmoid function and pair each category with a baseline category, Agresti refers to these as "baseline-category logits." *Id.* These models are referred to in the statistical software STATA as "Multinomial (polytomous) logistic regressions," and the command to run such regression is "mlogit."[18] In the SAS statistical software, the command "PROC LOGISTIC" can handle situations where the dependent variable has more than two categories. Variables of that kind are referred to as "polychotomous variables" and they may be either ordinal or nominal.[19]

The Commission notes that the Public Representative's comment regarding a possible alternative estimation method to the Postal Service's separate logistic regressions is about the model referred to by Agresti as "baseline-category logits." The Public Representative explicitly refers to page 174 of a book on categorical data analysis by Agresti. PR Comments at IV-8 n.13. The Public Representative reproduces the equations upon which the alternative estimation method is based. *Id.* at IV-9 n.17.

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[17] Engel, J., "Polytomous logistic regression," *Statistica Neerlandica,* Vol. 42, No. 4, at 233-52 (1988).

[18] *See* the description of the command at stata.com, available at *https://www.stata.com/manuals13/rmlogit.pdf*.

[19] *See*, *e.g.*, Eric Elkin, "Beyond Binary Outcomes: PROC LOGISTIC to Model Ordinal and Nominal Dependent Variables," SAS Global Forum (2012), available at *https://support.sas.com/resources/papers/proceedings12/427-2012.pdf*.

Based on these observations, which seek to clarify possible ambiguities concerning the estimation method advocated by the Public Representative, the Commission finds the question of whether an alternative method of estimation should also be considered for the sake of comparison to be both relevant and important.

The main reason provided by the Postal Service for disregarding an alternative estimation method is that it does not apply in the present case. This, the Postal Service asserts, is because the outcome in the present case is ordinal, as opposed to being nominal, as assumed by the estimation method proposed by the Public Representative. Bradley Evaluation at 13-14.

The Commission notes, in this regard, that the choice by the Postal Service to estimate independently a set of regression equations involving a common outcome variable and a common explanatory variable, where each estimation uses a different subsample, already disregards any possible ordinal nature of the outcome variable in the estimations. In particular, the separate regression models are estimated under the implicit assumption of independence of irrelevant alternatives (IIA). For example, in modeling the pair (EAS-20, EAS-21), it is assumed that the presence of any EAS grade other than those in the pair is irrelevant to their relative log odds, an assumption also shared by the multinomial logistic regression model. In this regard, the Stata manual states that:

> [a] stringent assumption of multinomial and conditional logit models is that outcome categories for the model have the property of independence of irrelevant alternatives (IIA). Stated simply, this assumption requires that the inclusion or exclusion of categories does not affect the relative risks associated with the regressors in the remaining categories.

See stata.com, available at *https://www.stata.com/manuals14/rhausman.pdf*.

The only ordering considered in the Postal Service's separate regressions is between the two members in each pair of EAS grades and the corresponding coding of the outcome, *i.e.*, "1" if the post office is in the higher (the one with higher minimum

salary) of the two EAS grades and "0" if the post office is in the lower grade. However, it is well known that in a dichotomous logistic regression, reversing the order of the outcome values by switching 1 values to 0 and 0 values to 1 only reverses the signs of the coefficients.[20] The Postal Service's estimation does not, therefore, account in any statistical way for the ordered nature of the EAS grades.

In light of the foregoing, the Commission finds that it is both methodologically and statistically worth exploring alternative estimation methods, which also ignore the ordered nature of EAS grades, make the IIA assumption, and have the potential for improving the efficiency of the estimation.[21]

The Commission used the baseline-category logits to re-estimate the Postal Service's models after simultaneously applying the data trimming conditions to discard the observations considered as outliers in Proposal Ten's separate regressions. The results are identical to those reported by Proposal Ten. *See* Library Reference PRC-LR-RM2020-2/1. From the identity of the results, the Commission concludes that the data provide no evidence of efficiency loss in estimating the model as done in Proposal Ten.

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[20] *See*, *e.g.*, Allison Paul D., *Logistic Regression Using SAS: Theory and Application, Second Edition* 2nd Edition, SAS Institute, at 96 (2012).

[21] *See, e.g.*, Colin B. Begg and Robert Gray, "Calculation of Polychotomous Logistic Regression Parameters Using Individualized Regressions," Biometrika , Vol. 71, No. 1, at 11-18 (1984), which studies individualized logistic regression and finds that estimates of the binary logits are consistent but relatively inefficient estimates of the multinomial logit model; J. Scott Long and Jeremy Freese, *Regression Models for Categorical Dependent Variables using STATA*, 3rd edition, Chapter 8, at 385 (2014), which explains that the problem with estimating a multinomial logistic model by estimating a series of binary logits is that each binary logit is based on a different sample; and J. Scott Long, "Regression Models for Nominal and Ordinal Outcomes" (2012), available at *https://jslsoc.sitehost.iu.edu/files_research/cdanor/Long%20-%20Nominal%20Ordinal%20Regression%20Models%20-%202012-05-29.pdf*, which explains that a multinomial logistic model obtains efficient estimates by simultaneously estimating all equations while imposing mathematically necessary constraints that link the equations.

3.   Use of a Single Percentage Change to Determine Elasticities and Related Sensitivity Analysis

In Proposal Ten, the Postal Service's variability calculations employ the assumption that WSCs increase by 10 percent and make this choice based on a sensitivity analysis. Bradley Study at 42. The Public Representative has concerns with this approach. PR Comments at V-16.

The Public Representative states that in the Bradley Study, a single percentage (*i.e.,* 10 percent) change in WSCs is applied to existing WSC levels in order to transform the marginal effect calculation of each EAS grade and estimate variability. *Id.* He notes that for other regression analyses, the Commission uses the mean value of a cost driver to determine variability, which in this instance would be "the average annual growth rate in WSC's by grade." *Id.* The Public Representative states that the Bradley Study presents several arguments for rejecting the use of the average annual growth rate in WSCs by EAS grade. *Id.* These arguments demonstrate that the use of the average annual growth rate in WSCs by EAS grade would result in low Postmaster cost variability. *Id.* He notes that "[t]he Bradley [Study] assumes that something is wrong if its chosen model does not produce a variability estimate" similar to the current model, instead of the "possibility that its model could show there was no significant volume variability" in Postmaster costs. *Id.* at V-17.

Not only does the Public Representative disagree with the use of the 10 percent growth rate of WSCs, but, in addition, he also disagrees with the Bradley Study's approach that tests Postmaster costs variability calculations when the growth rate of WSCs ranges from 2.5 percent to 20 percent, in 2.5 percent increments. *Id.* at V-17-V-18. The Bradley Study tests these growth rates using sensitivity analysis, which, it claims, shows that at a WSC growth rate of 10 percent, the variability of Postmaster costs stabilizes at around 7 percent. Bradley Study at 44.

The Public Representative notes two issues with this approach. First, he notes that the Bradley Study uses above-normal growth rates in WSCs, which automatically

leads to relatively similar variabilities. *Id.* at V-18. The Public Representative states that it is "one thing to claim to choose a test case WSC growth rate…where the resulting variability levels are relatively stable, and another matter to both claim that 7 percent [variability] is that level and that 10 percent is the appropriate matching [percent change in WSCs]." *Id.* at V-19.

Second, the Public Representative states that "using cost-weighted variabilities to choose the appropriate test case percent changes in WSCs…will tend to blend the results together." *Id.* He also points out that the Bradley Study fails to explain why only a limited range of WSC change (from 2.5 to 20 percent) was used instead of larger range of potential change. *Id.* Using his own analysis, the Public Representative contends that the Bradley Study could have "reasonably chosen" a WSC growth rate "anywhere between 3.5 percent and 60 percent" to test variability. *Id.* at V-20.

Bradley notes that the purpose of the sensitivity analysis was to show that the logistic regression he used produces "very similar variabilities for both relatively low and relatively high WSC growth rates…." Bradley Evaluation at 17. He maintains that the sensitivity analysis shows that the estimated variabilities are "robust and are thus applicable to a wide range of different WSC changes." *Id.* at 18.

He disagrees with the Public Representative's assertion that a single WSC test growth rate of 7 percent was chosen or that a single WSC test growth rate of any percentage was chosen. *Id.* at 19. Bradley maintains that the purpose of the sensitivity analysis was to calculate variabilities for different WSC growth rates so that a single growth rate need not be selected. *Id.*

Bradley also disagrees with the Public Representative's concerns related to the use of cost-weighted variabilities. He states that the use of cost-weighted individual variabilities to produce an overall variability "is well established within the Commission's attributable costing methodology." *Id.* at 20.

As it relates to the range of WSC growth rates used in the sensitivity analysis, Bradley contends that the Public Representative fails to understand the reasoning behind the range selected in the Bradley Study (2.5 percent to 20 percent). *Id.* Bradley notes that the WSC growth range lower bound represents the average annual WSC growth rate and the higher bound represents the WSC growth rate over multiple years, thereby examining "a range of conditions that encompass likely possible outcomes." *Id.* He maintains that the examination of WSC growth rates outside of the Bradley Study range, as the Public Representative suggests, is "simply not sensible." *Id.* at 21.

As a prelude to its analysis, the Commission provides a detailed description of the classifications of post offices that are performed in Proposal Ten. The proposal involves two classifications. In subsection a., the Commission assesses the classification of post offices upon which the calculation of the baseline cost is based. In subsection b., the Commission assesses the classification of post offices upon which the calculation of the new cost and the cost change is based. For a given pair of EAS grades, each of the two classifications only concerns the post offices in the lower grade.

The first classification assigns the minimum salary of the higher EAS grade to each of the post offices with an estimated probability larger than 0.5. The other post offices are assigned the minimum salary of their current EAS grades, *i.e.*, the lower of the two EAS grades in the considered pair. Following the first classification, the total minimum salary, *i.e.*, the initial or baseline cost, is determined.

The second classification follows the same procedure as the first, with the difference that the WSCs are scaled up uniformly by a factor (denoted in the proposal by θ) and the estimated probabilities are recalculated accordingly, before performing the classification.[22] The scaling-up of the WSCs represents the assumed increase in the WSCs that induces a change in the total minimum salary in the corresponding EAS grade. To clarify the terminology employed in the rest of the Order, the first classification is referred to as "the classification" and the second classification as "the re-classification."

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[22] Bradley Study at 38; *see*, *e.g.,* Library Reference USPS-RM2020-2/1, November 29, 2019, folder "Calculate Variabilities," file "Calculate Variability For 18 and 18B.txt."

a.   Commission's Assessment of the Classification of Post Offices Based on the Logistic Regression

The Commission begins this section by noting that the Postal Service's decision to use a classification-based method to determine Postmaster cost variability was not explained. The Commission does not make a determination as to whether the classification-based method is the most appropriate approach to calculate variability when the cost variable is discrete. The Commission analyzes Proposal Ten on its own terms to determine if it results in an improvement from the current methodology. 39 U.S.C. § 3652(e)(2). Nonetheless, there are questions about whether the classification approach is well-suited to the estimation of Postmaster variability.

As applied in Proposal Ten, the classification approach has the potential to result in variability estimates that are too large or too small. For example, suppose that the probability of moving up a grade is relatively low,[23] with almost all post offices having less than a 0.50 probability of promotion even after the WSCs are scaled up by 10 percent. Based on a classification approach with a 0.50 cutoff, a 10 percent increase in WSCs would lead to a very small number of grade changes, resulting in a variability estimate of approximately 0 percent. This estimate is low relative to alternatives that do not rely on classification. For example, the use of an expected minimum-salary approach based on the estimated probabilities without resorting to classification in calculating marginal effects would not lead to such a result, as long as the logit model is correctly specified. This potential effect of categorization is recognized in the logit model literature. For example, the author of a textbook on logit models explains "[f]or practical purposes there is little difference between the values of [predicted probability] = 0.48 and [predicted probability] = 0.52, yet use of a 0.5 cutpoint would establish these two individuals as markedly different."[24]

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[23] For example, if one eliminates the observations considered in the proposal to be outliers, the proportion of post offices that have an estimated probability larger than 0.5 in EAS-21 is 17/1169, or about 1.4 percent of all the post offices in the grade.

[24] See Hosmer, *Applied Logistic Regression*, 3rd Edition, at 171.

If the objective of the Postal Service was to evaluate individual Postmasters based on their probability of moving up a grade then the proposed approach could be used to classify Postmasters into groups: those likely and those unlikely to be promoted. However, this is not the goal of Proposal Ten, which seeks to estimate marginal effects from changing WSC. This does not necessarily require that Postmasters be classified into groups. Instead, the probabilities estimated in the Postal Service's logit model can be used to calculate marginal effects, treating each Postmaster as having a probability of moving up that depends on WSC and evaluating the expected cost increase in the aggregate. This alternative approach avoids the need to classify Postmasters into groups.

Despite these potential drawbacks, the Commission finds the logistic regression and the probability cutoff point of 0.5 (the probability-threshold) used to perform the first classification of post offices in Proposal Ten to be consistent with standard practice in the classification literature.[25] Hosmer describes the classification method used in Proposal Ten and also mentions the popularity of the use of the 0.5 cutoff point. Hosmer at 170.

Because it is foundational to the remainder of the Commission's analysis, the Commission seeks to clarify the theoretical justification for the 0.5 cutoff point in classifications, such as the one used in Proposal Ten. A theoretical classifier, known in machine-learning terminology as the "Bayes classifier,"[26] is based on the regression function of the binary outcome on the explanatory variables, which, in the present context, is WSCs. The regression function, also called the conditional expectation,[27] is

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[25] *See* Hosmer, *Applied Logistic Regression*, 3rd Edition, at 279-84 (Hosmer).

[26] *See, e.g.*, Luc Devroye, Laszlo Györfi, & Gabor Lugosi, *A Probabilistic Theory of Pattern Recognition*, Springer, (1996) (Luc Devroye, *et al*.). The Bayes classifier is the optimal choice to minimize the probability of misclassification. The appellation "Bayes classifier" relates to Bayes' famous theorem in probability; however, it does not mean that the optimality of the classifier is based on any subjective choice of a prior probability as in the Bayesian inference. *See, e.g.*, Arnold Zellner, "Bayesian Econometrics," *Econometrica,* Vol. 53, No. 2, at 253-69 (1985).

[27] *See* Bruce Hansen's manuscript, *Introduction to Econometrics,* at 93 (2021), available at *https://www.ssc.wisc.edu/~bhansen/probability/Intro2Metrics.pdf*.

the best predictor of the outcome based on the explanatory variables.[28] The Bayes

classifier categorizes the items by setting the probability-threshold for the regression

function to 0.5. The Bayes classifier has been mathematically proved to be optimal,

compared to all possible classifiers, because it has the lowest probability of

misclassification.[29] The Bayes classifier is, therefore, the optimal choice to minimize the

probability of misclassification if the regression function is known.

The Commission stresses that classification in the present context is not a goal

per se, but provides a means to compute the cost after tallying the classification results.

The tallying uses the empirical distribution of the sampled WSCs. It is therefore

important to dissociate the optimality of the classification process from the use of the

classification results. The Commission also notes that there are methods of

classification that do not require the building of a model, such as the logistic model

employed by the Postal Service.[30]

In practice, the regression function is, however, unknown and therefore cannot

be computed explicitly. Consequently, the Bayes classifier is unfeasible. Under the

assumption that the Postal Service correctly specifies the relationship between the

binary outcome and the WSCs, the maximum likelihood estimators of the model's

parameters a and b converge to their respective theoretical values. When the

estimated regression function is used to approximate the theoretical regression function,

the resulting classifier is called a plug-in classifier.[31] The Commission therefore

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[28] *See* Bruce Hansen's manuscript, *Econometrics,* at 26-27 (2021), available at *https://www.ssc.wisc.edu/~bhansen/econometrics/Econometrics.pdf*.

[29] Luc Devroye, *et al.* at 10.

[30] Some classifiers are based, for example, on kernel regression or on the k-nearest neighbors method. *See, e.g.*, Yao-Yuan Yang et al., "Robustness for Non-Parametric Classification: A Generic Attack and Defense" (2020), available at *https://arxiv.org/pdf/1906.03310.pdf*.

[31] *See, e.g.,* Jean-Yves Audibert & Alexandre B. Tsybakov, "Fast Learning Rates for Plug-in Classifiers," *The Annals of Statistics*, Vol. 35, No. 2, 608-33, at 2 (2007), available at *https://arxiv.org/pdf/0708.2321.pdf*; *see also* Aaron Fisher & Edward H. Kennedy, "Visually Communicating and Teaching Intuition for Influence Functions" (2019), available at *https://arxiv.org/pdf/1810.03260.pdf*.

concludes that under the correct-specification assumption and assuming that the actual outcomes were unknown, Proposal Ten's classifier minimizes the probability of misclassification in a large sample, regardless of the distribution of WSCs.

The Commission finds it acceptable for Proposal Ten to use the logistic regression to classify the post offices and to set the cutoff point for the estimated probabilities, *i.e.,* to set the probability-threshold to 0.5. In drawing this conclusion, the Commission does not claim, nor does it assume, that the Postal Service's classification-specific goal is to minimize the probability of misclassification. In this regard, the Postal Service provides no technical justification for using 0.5 as a cutoff point nor does it discuss the optimality of the classification method that it employs. It is nevertheless important to clarify the mathematical and statistical reasons that make the cutoff point of 0.5 an optimal cutoff point, as this question is relevant to the Proposal Ten's re-classification of post offices.

b.   Commission's Concerns Regarding the Re-Classification Procedures

The Commission stresses the fact that the sample that is used in the re-classification is the same sample of WSCs as the one underlying the first classification, except for being scaled up by a uniform factor θ. The Commission has three concerns regarding the choice of the scaling factor θ in the re-classification and the determination of cost changes, based on the re-classification results.

The first concern is that by choosing to use a common scaling factor for all of the EAS grades to study the responsiveness of the cost to changes in WSCs, the Postal Service does not account for the apparent diversity in the distributions of the WSCs across the EAS grades. Alternatively, it implicitly assumes that despite the diversity of the WSC distribution across the EAS grades, the responsiveness of the corresponding total minimum salaries to changes in the WSCs can be accurately measured by applying an equal percentage change in WSCs to all the EAS grades.

In statistics, the expression "nonparametric estimation" is used to describe situations in which the parameter is a function that varies with its argument, as opposed to being a constant. In the estimation of a probability density, the parameter of interest is the density, and it is a function of WSCs. Kernel estimation is a popular nonparametric method of estimating probability densities.[32] An examination of histograms of the WSCs reveals that the distributions of each EAS grade are somewhat different in their shapes, heights, and spreads, suggesting the need for grade-specific percentage changes in WSCs for the re-classifications.[33]

If the classification was performed for its own sake with no need to know the number of post offices falling in the classes, the distribution of the WSCs would not matter in the classification. However, because the tallies above and below the cutoff point of the estimated probabilities depend on the distribution of the WSCs and these tallies are used in the calculation of the costs, the sampling or empirical distribution of the WSCs matters for the calculation of the costs. The Commission finds that the specific characteristics of these distributions within each EAS grade are, therefore, important factors that should inform the choice of the scaling factor θ. Consequently, the Commission finds the application of the same scaling factor to determine the assumed change in WSCs in each of the EAS grades to be inappropriate.

The Commission's second concern relates to the magnitude of the scaling factor, the sensitivity analysis conducted to choose the scaling factor, and, more generally, the

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[32] For introduction to kernel estimation, *see* John DiNardo & Justin L. Tobias, "Nonparametric Density and Regression Estimation," *Journal of Economic Perspectives*—Vol. 15, No. 4, pp. 11-28 (2001).

[33] *See* Library Reference PRC-LR-RM2020-2/2. The histograms are estimates of the unknown probability densities. The kernel estimates involve choices regarding bandwidths, and the histograms involve choices regarding partition of the WSCs in bins. Although the distributional shapes displayed in the library reference depend on specific bandwidth and bin choices, the Commission maintains that alternative but standard choices regarding bandwidth and bins would only confirm the visual differences between these probability distributions.

specific way in which the WSCs are assumed to change in the determination of cost change.

Before addressing these three points, the Commission notes that the logistic form of the probability model implies a one-to-one correspondence between the WSCs and the estimated probabilities. Knowing one of these (the WSC or the probability) permits determination of the other.[34] Accordingly, there is a strict correspondence between setting a cutoff point for the estimated probabilities for the purpose of classification and setting a cutoff point for the observed WSCs for the same purpose. Two cutoff points can, therefore, be distinguished with respect to the classification. The first one relates to the estimated probabilities, and is referred to in this Order as the probability-threshold. The second cutoff point relates to the WSCs and will be referred to as the WSC-threshold. Scaling up the WSCs by a factor is equivalent to lowering the WSC-threshold through its division by the scaling factor.

The classification of post offices can be performed using two equivalent methods. The first method (Method 1) is applied in Proposal Ten and is based on the estimated probabilities. It classifies a post office in the higher EAS grade if and only if the corresponding estimated probability is larger than the probability-threshold. The second method (Method 2) performs the classification by comparing the WSCs to the calculated WSC-threshold. It classifies a post office into the higher EAS grade if and only if its corresponding WSC is larger than the WSC-threshold. Scaling-up the WSCs by a factor induces a corresponding division of the WSC-threshold by the same factor, and vice-versa. This operation results in a lower WSC-threshold.

Table 1 below displays the WSC-threshold corresponding to the 0.5 probability-threshold, for the different EAS grades. Column (2) displays the WSC-thresholds that would be used in the first classification if Method 2 was employed. The scaling-up of

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[34] This correspondence is described in Table 1 of Library Reference PRC-LR-RM2020-2/5, file "A3.docx."

WSCs preceding the re-classification also translates into a division of the WSC-threshold by the scaling factor. Column (3) contains the ratios of the numbers in column (2) to the scaling factor $\theta = 1.1$. These numbers are the modified WSC-thresholds that would be used in the re-classification if Method 2 was employed.[35]

Table 1
WSC-Thresholds for Classification and Re-Classification

Regression	WSC Classification Threshold	WSC Re-Classification Threshold
(1)	(2)	(3)
EAS-18 to EAS-18B	2,068	1,880
EAS-18B to EAS-20	5,426	4,933
EAS-20 to EAS-21	13,059	11,872
EAS-21 to EAS-22	25,936	23,578
EAS-22 to EAS-24	68,970	62,700
EAS-24 to EAS-26	161,046	146,406

Source: Library Reference PRC-LR-RM2020-2/3, Excel file "WSCthresholds.xlsx."

Further, using Method 1 to re-classify the post offices after scaling up the WSCs is equivalent to using the same method (Method 1) to re-classify the post offices by keeping the WSCs unchanged and lowering instead the probability-threshold.[36] Using the formula to compute the corresponding lower probability-threshold,[37] the Commission has calculated the reduction in the probability-threshold corresponding to a scaling up of the WSCs. The result of this calculation is discussed below.

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[35] These numbers result from using the formulae contained in Table 2 of Library Reference PRC-LR-RM2020-2/5, file "A1.docx." The formula to compute the WSC cutoff point is provided in Library Reference PRC-LR-RM2020-2/5, file "A2.docx."

[36] This equivalence is described in Table 2 of Library Reference PRC-LR-RM2020-2/5, file "A1.docx."

[37] This formula is provided in the Table 2 (last row, column 3) of Library Reference PRC-LR-RM2020-2/5, file "A1.docx."

i.   Scaling the WSCs by 10 percent is equivalent to decreasing the probability-threshold by at least 93 percent in the re-classification.

As already noted, Proposal Ten's re-classification is equivalent to keeping the original sample of WSCs unchanged and repeating the first classification after lowering the cutoff point for the estimated probabilities from its initial level of 0.5. The results of the 10 percent scaling of the WSCs are shown in Tables 2 and 3 below. Table 2 displays the probability thresholds corresponding to the scaling of the WSCs by 10 percent, along with the values that they would take if alternative values of the scaling factor are used.

Table 2
Equivalent Reduction in the Probability-Threshold
Corresponding to the Scaling-up of the WSCs

Pair of EAS Grades	Classification Probability-Threshold	Re-Classification Probability Threshold	Percentage Decrease in the Probability Threshold	Probability Threshold Under Alternative Values of the Scaling Factor	
		$\theta=1.1$		$\theta=1.025$	$\theta=1.0025$
(1)	(2)	(3)	(4)	(5)	(6)
(EAS-18; EAS-18B)	0.5	0.000003	-100.00%	0.03220	0.41388
(EAS-18B; EAS-20)	0.5	0.023328	-95.33%	0.26856	0.47441
(EAS-20; EAS-21)	0.5	0.015630	-96.87%	0.24759	0.47162
(EAS-21; EAS-22)	0.5	0.012794	-97.44%	0.23758	0.47023
(EAS-22; EAS-24)	0.5	0.032035	-93.59%	0.28609	0.47664
(EAS-24; EAS-26)	0.5	0.003138	-99.37%	0.17572	0.46057

Source: Library Reference PRC-LR-RM2020-2/3.

The relative decreases from the 0.5 cutoff point in the probability thresholds corresponding to the scaling factor $\theta = 1.1$, seen in column (4), range from approximately 94 percent to 100 percent. For example, for the grade pair (EAS-18, EAS-18B), scaling up the WSCs by 1.1 is equivalent to lowering the probability

threshold from 0.5 to 0.000003, *i.e.*, by 99.99 percent (almost 100 percent).[38] The
smallest drop occurs in the grade pair (EAS-22, EAS-24) with a 93.59 percent
reduction. The last two columns of the table show what these thresholds would be if
smaller values of the scaling factor were used.

Table 3 below displays the means and the standard deviations for the estimated
probabilities, along with the ratios of the drop in the probability-thresholds to the
standard deviations. The Commission notes that in grade EAS-18, the average of the
estimated probabilities is 0.0071755, and their standard deviation is 0.056820. Hence,
the decrease in the probability-threshold from 0.5 to 0.000003 equals -0.499997
(0.000003 minus 0.5), which is 8.8 standard deviations (0.499997/0.05682).

Table 3
Drop in the Cutoff Points Expressed in Numbers of Standard Deviations

Pair of EAS Grades	Classification Probability-Threshold	Re-Classification Probability Threshold for $\theta=1.1$	Decrease in the Probability-Threshold	Standard Deviation	Ratio of Decrease in Probability-Threshold to Standard Deviation
(1)	(2)	(3)	(4)	(5)	(6)
(EAS-18; EAS-18B)	0.5	0.000003	-0.499997	0.056820	-8.80
(EAS-18B; EAS-20)	0.5	0.023328	-0.476672	0.0983596	-4.85
(EAS-20; EAS-21)	0.5	0.015630	-0.484370	0.0835553	-5.80
(EAS-21; EAS-22)	0.5	0.012794	-0.487206	0.1012042	-4.81
(EAS-22; EAS-24)	0.5	0.032035	-0.467965	0.0820933	-5.70
(EAS-24; EAS-26)	0.5	0.003138	-0.496862	0.0629802	-7.89

Source: Table 2, *supra.*

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[38] The Commission notes that in the EAS-18 grade, the average of the estimated probabilities is
low at 0.0115205, and the standard deviation of the estimated probability is 0.0866622. The decrease in
the probability-threshold from 0.5 to 0.000003 is equal to 0.499997 (0.000003-0.5), which, expressed in
number of standard deviations, is equal to 5.55 standard deviations (0.499997/0.09). Even though 3,701
Postmasters in EAS-18 still have estimated probabilities equal to or lower than the re-classification
threshold of 0.000003, this fact matters less in the Commission's view than the fact that having a
probability just above 0.000003 becomes sufficient for a Postmaster to be classified in the higher EAS
grade.

This table shows that the cutoff points have dropped by five to nine times the standard deviation.[39] The Commission finds these drops excessive and indicative of the excessiveness of the value 1.1 chosen for the scaling factor θ. The Commission is concerned that these low probability-thresholds cannot be reconciled with the popular 0.5 cutoff point and the optimality of the resulting classifiers. As previously explained, the optimality of the Bayes classifier is based on the criterion of minimizing the probability of misclassification.

The Commission does not assume, nor does it claim, that the Postal Service's choice of its classification method is grounded on, or guided by this criterion. However, the Commission finds that because the hypothetical cost change is calculated through a classification procedure, its reasonableness depends not only on the magnitude of the change in the WSCs, but also on the corresponding magnitude of the change in the re-classification cutoff point. These two changes are mathematically related to one another, a relationship which the Postal Service appears to have overlooked.

The Commission acknowledges that the 0.5 cutoff point may actually not be optimal if the criterion of optimality is not the minimization of the probability of misclassification. In this regard, the Commission notes that a strand of the literature on classification is concerned with estimating the optimal cutoff point, both in the general case and in the particular cases where classifications are based on the logistic regression.[40]

The Commission finds that if, as demonstrated, the re-classification of post offices in Proposal Ten differs from the first classification only in the lowering of the

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[39] The standard deviation of a variable is roughly the average distance of the values of the variable from their mean.

[40] For the calculation of bootstrap confidence intervals for the optimal cutoff points, *see, e.g.,* the R package on the estimation of optimal cutoff point, available at *https://cran.r-project.org/web/packages/OptimalCutpoints/OptimalCutpoints.pdf*; Zheng Zhang *et al.*, "Bootstrap confidence intervals for the optimal cutoff point to bisect estimated probabilities from logistic regression," Statistical Methods in Medical Research 0(0), at 1-13 (2019).

probability cutoff point from its initial value of 0.5, the proposal then lacks a clear rule for choosing by how much the cutoff point can be changed without compromising the optimality of the classification, regardless of the criteria defining that optimality. The Commission also finds that the confidence interval in which the cutoff point can be changed to still generate a statistically reliable (hypothetical) increase in the cost is an important question, which Proposal Ten does not address either.

ii. The proposed methodology is not robust with respect to the way in which WSCs are assumed to increase in the re-classification.

The Commission agrees with the Postal Service's assertion that

> ...to accurately calculate a variability, it is important to take into account the actual distribution of WSCs across the offices in a given grade. The result of an increase in WSCs will differ, for example, if offices are clustered toward the bottom of the WSC range as opposed to being clustered toward the top of the range.

Bradley Study at 33.

The Commission does not necessarily object to transforming the sample (in this case, scaling the sample) for the purpose of re-classification, and notes that a counterfactual empirical distribution can be obtained from an observed empirical distribution via a transformation of the corresponding sample. The Commission also notes that the technique of modifying slightly a reference distribution along defined paths is common in semiparametric econometrics, in the domain of statistical robustness, and in other areas of economics.[41] Data transformation is also used in the

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[41] Whitney K. Newey, "The Asymptotic Variance of Semiparametric Estimators," *Econometrica,* Vol. 62, No. 6, at 1349-82 (1994); Van der Vaart, A., "On Differentiable Functionals," *Annals of Statistics*, Vol. 19, at 178-204 (1991); Hidehiko Ichimura, Whitney K. Newey, "The Influence Function of Semiparametric Estimators" (2015), available at *https://arxiv.org/pdf/1508.01378.pdf*; Aaron Fisher & Edward H. Kennedy, "Visually Communicating and Teaching Intuition for Influence Functions" (2019), available at *https://arxiv.org/pdf/1810.03260.pdf*; Yaroslav Mukhin, "On Counterfactual Analysis of Differentiable Functionals" (2019), available at *https://economics.mit.edu/files/18257*.

estimation of probability density functions.[42] In this connection, the Commission notes

the following relation between the theoretical cumulative distribution function (CDF),

F_{wsc}, of the variable WSC, and the theoretical CDF, $F_{\theta WSC}$, of its transformed version,

i.e., θWSC.[43] This relation is:

$$F_{\theta WSC}(x) = P(\theta WSC \leq x) = P\left(WSC \leq \frac{x}{\theta}\right) = F_{wsc}\left(\frac{x}{\theta}\right).$$

The Commission also stresses the similar relation between the empirical CDFs of

WSCs and that of its scaled version:

$$\frac{\sum_{i=1}^{N} \mathbb{1}_{\{\theta WSC_i \leq x\}}}{N} = \frac{\sum_{i=1}^{N} \mathbb{1}_{\{WSC_i \leq \frac{x}{\theta}\}}}{N}$$

The transformed data, i.e., the θWSCs, hence the counterfactual empirical distribution,

$\frac{\sum_{i=1}^{N} \mathbb{1}_{\{\theta WSC_i \leq x\}}}{N}$, are the inputs into the re-classification. As a result, the calculated cost

change and the resulting variability both depend strongly on the transformation used to

measure the change in WSCs.

The Commission emphasizes that the scaling-up of the observed WSCs to

express their change corresponds to a specific assumption made about the way that the

empirical CDF of the WSCs changes. The assumed changes in WSCs that underlie the

proposed variabilities are illustrated in Figure 1.[44] In the figure, the original WSCs are

represented on the x-axis from the lowest to the highest value. The y-axis represents

the scaled versions of these WSCs. Hence, the dashed line is the plot of the scaled

WSCs against the unscaled ones. To provide a visual way to measure how the scaled

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[42] See, e.g., B. W. Silverman, *Density Estimation for Statistics and Data Analysis*; Chapman & Hall, at 30 (1986).

[43] For a given value x, the CDF, F(x), describes the probability that a random variable, WSCs for example, with a given probability distribution takes a value less than x, i.e., F(x)=Probability (the random variable is less than or equal to x). See, e.g., Bruce Hansen *Introduction to Econometrics*, at 30 (2021), available at *https://www.ssc.wisc.edu/~bhansen/probability/Probability.pdf*.

[44] Figures 1 through 3 are all based on the WSCs pertaining to the EAS-20 grade.

and unscaled WSCs differ, the figure also displays a solid line with the slope equal to 1, which is the plot of the original unscaled WSCs against themselves.

Figure 1
Specific Increase in WSCs Assumed in Proposal Ten
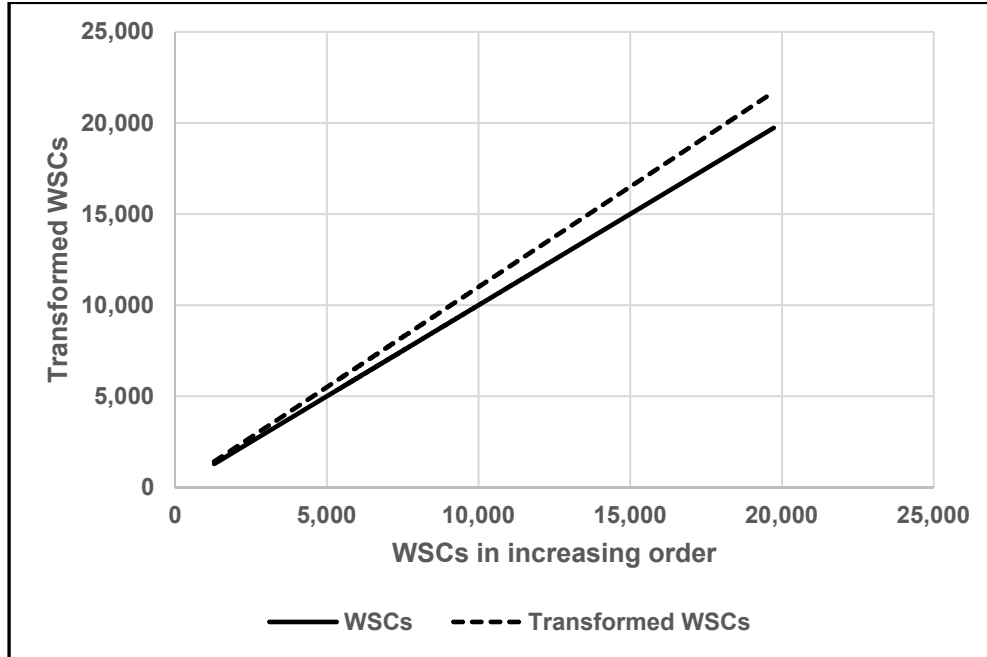
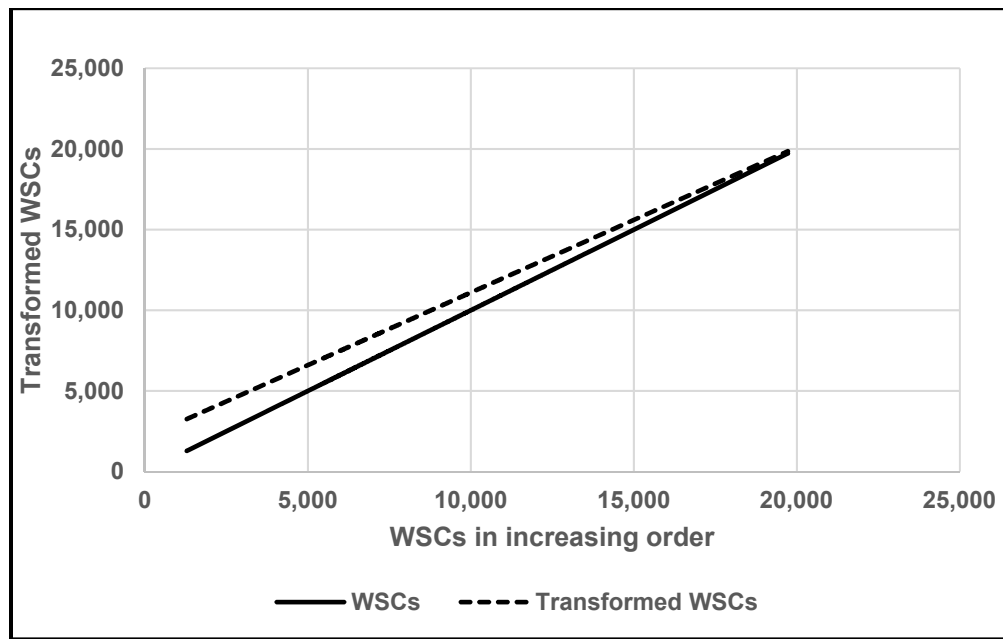Source: PRC Analysis of the reference data contained in Excel file "April WSC Data.xlsx."

In Figure 2, the Commission makes an alternative assumption, which is a mirror image of Proposal Ten's assumption.[45] The formula employed for the transformation of the WSCs is:

$$WSC_i + [\min(WSC) + \max(WSC) - WSC_i](\theta - 1),$$

for all i, where $\min(WSC)$ and $\max(WSC)$ denote the minimum and the maximum WSC in the sample, respectively.

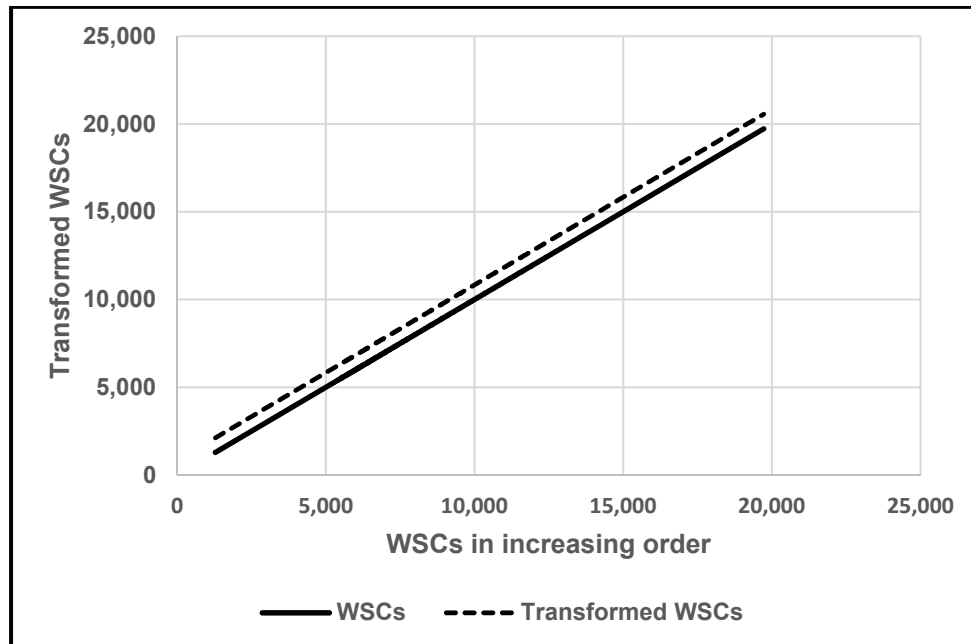[45] The area between the two lines is the same in Figure 1 and Figure 2.

Figure 2
Hypothetical Alternative Increase in WSCs

Source: PRC Analysis of the reference data contained in Excel file
"April WSC Data.xlsx."

In a third example, the Commission assumes a parallel increase in WSCs, as displayed in Figure 3.

Figure 3
Parallel Increase in WSCs

Source: PRC Analysis of the reference data contained in Excel file
"April WSC Data.xlsx."

To calculate the variabilities corresponding to the alternative assumptions, it is necessary to first determine the relative change in WSCs, which comes as the denominator of the respective variabilities. This is done by drawing an analogy to the proposed variability.[46]

Table 4 below displays the tallies resulting from the alternative assumptions regarding the WSC change. The assumption on parallel change (Figure 3) produces changes in counts that are between the Proposal Ten assumption and its symmetric assumption.

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[46] The calculations are in Library Reference PRC-LR-RM2020-2/5, file "A4.docx."

Table 4
Classification Counts and Re-Classification Changes in Counts

Regression	Classification: Initial Counts	Re-Classification: Change in Counts		
		Proposal Ten (Fig. 1)	Symmetric to Proposal Ten's Change in WSC (Fig. 2)	Parallel Change in WSC (Fig. 3)
(1)	(2)	(3)	(4)	(5)
EAS-18 to EAS-18B	15	379	34	225
EAS-18B to EAS-20	68	308	81	180
EAS-20 to EAS-21	20	194	69	136
EAS-21 to EAS-22	17	104	11	81
EAS-22 to EAS-24	7	44	16	23
EAS-24 to EAS-26	2	14	1	9

Source: Library Reference PRC-LR-RM2020-2/5, file "A4.docx."

Table 5 displays the variabilities corresponding to the two alternative assumptions.

Table 5
Variabilities Based on the Different Assumptions

Regression	Variability Based on		
	Proposal Ten, 10 Percent Scaling of All WSCs (Fig. 1)	Increase in WSC (Fig. 2)	Increase in WSC (Fig. 3)
(1)	(2)	(3)	(4)
EAS-18 to EAS-18B	8.98%	0.94%	5.33%
EAS-18B to EAS-20	6.82%	1.73%	3.99%
EAS-20 to EAS-21	6.48%	2.16%	4.54%
EAS-21 to EAS-22	2.88%	0.51%	2.24%
EAS-22 to EAS-24	6.08%	1.67%	3.18%
EAS-24 to EAS-26	11.87%	0.81%	7.63%
Cost Weighted Average	7.01%	1.30%	4.32%

Source: Library Reference PRC-LR-RM2020-2/5, file "A4.docx."

As Table 5 shows, the variabilities differ considerably with the assumption made about the change in WSCs. This is because the changes in the re-classification counts of post offices moving up to the higher grade are dependent on the assumption regarding the increase in WSCs. As can be expected from the comparison of Figures 1, 2, and 3, and the corresponding counts in Table 4, this change is smaller under the assumptions underlying Figures 2 and 3, compared to the Proposal Ten assumption illustrated in Figure 1.

The difficulty entailed in choosing the appropriate change in WSCs led the Commission to seek an objective and realistic WSC percentage change based on the historical growth rates of aggregate WSCs observed over a sufficient historical period. However, the Commission finds the prospective implementation of this strategy to be unsatisfactory, because of data limitations, as discussed in the following section.

iii.   Proposal Ten Sensitivity Analysis

The Commission's main concern regarding Proposal Ten's sensitivity analysis is the lack of precise criteria on which the change in the WSCs is based in the re-classification procedure. In the absence of these criteria, the choice $\theta = 1.1$ is arbitrary. To support its conclusion that the choice of θ is arbitrary, the Commission has calculated the variabilities with successive values of the scaling factor θ such that the change in the counts increases by 1 as θ increases. For example, the variability curve for EAS-24 is displayed in Figure 4 with the scaling factor ranging from 1 to 2.[47]

Figure 4
Plot of the Variability Against the Scaling Factor: EAS-24

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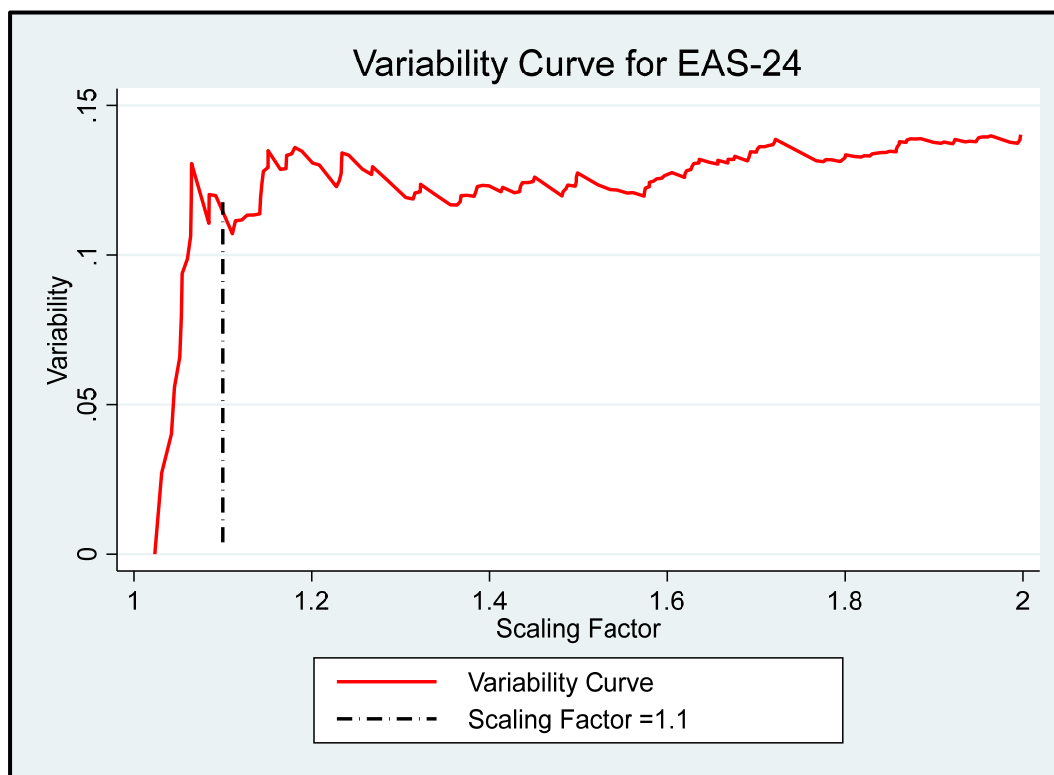
[47] These curves are similar to curves on charts presented by the Public Representative, with the difference that they are drawn over a larger and a more refined range of the scaling factor. PR Comments at VI-1-VI-4. Corresponding figures for the other EAS grades are presented in Library Reference PRC-LR-RM2020-2/2.

For any of the EAS grades, the Commission finds no particular reason to conclude that the variability estimated for the scaling factor equal to 1.1 is better, in any statistical or economic sense, than variabilities calculated for any other values of the scaling factor. For example, on the graph corresponding to EAS-24 (Figure 4), the curve appears to be flatter over the range 1.3 to 1.6 of the scaling factor, than it is at, or near, the value 1.1. Even when a range of the scaling factor is identified as a range over which the variability curve has a flat shape, the Commission finds no reason to have a preference for any particular value of the scaling factor within the identified range. In other words, in the absence of precisely defined and thoroughly justified rules for choosing the appropriate scaling factor, the Commission finds that the particular choice made by the Postal Service in Proposal Ten, namely the value 1.1 for the scaling factor, is arbitrary. The Commission finds that the failure of the Postal Service to base its choice of the scaling factor on precise data-driven criteria represents a major shortcoming of the proposal.

In its search for possible solutions to the Postal Service's unclear rules underlying the choice of WSC change, CHIRs explored the possibility of using historical trends of actual WSCs over a sufficiently long period to determine a reasonable percentage change in the WSCs. However, the available data set, as provided by the Postal Service, is deceptively small. A CHIR asked the Postal Service for aggregate annual data on WSCs covering the last 20 years, 2000 through 2019. CHIR No. 5, question 4.b. According to the Postal Service, these data exist only for 2012 through 2019, which allows the Commission to compute only seven year-over-year percentage changes in the aggregate WSCs. Response to CHIR No. 5, question 4.b. The Commission finds that a sample of only eight observations (the number of years from 2012 to 2019) does not provide a statistically reliable summary of the historical annual changes in WSCs. For the sake of comparison, the Commission notes the Postal Service's acknowledgment of the limitations placed on the existing methodology by reliance upon only 10 observations to estimate the Postmaster cost variability. *See* Petition, Proposal Ten at 3.

The Commission also finds the use of the expression "sensitivity analysis" in Proposal Ten confusing, both in the context of classification and in the context of econometrics. In the econometric literature, sensitivity analysis is explained by Magnus and Vasney as follows:

> The concept of sensitivity is closely related to the concept of robustness, with which readers may be more familiar…
> Sensitivity analysis deals not only with data perturbations, but also with model perturbations. Sensitivity to the model specification studies the changes in the model output (often an estimator, test or predicted value) when one or more of the assumptions underlying the model are perturbed.[48]

If the sensitivity analysis of Proposal Ten (which involves gradual change in the scaling factor θ until one particular value of it is retained) was performed for the purpose of checking the robustness of the first classification, the Commission would find the use of the expression sensitivity analysis to conform to the quoted meanings.[49]

For the reasons discussed above, the sensitivity analysis performed by the Postal Service does not present clear criteria that can be relied upon to choose the appropriate scaling factor used to describe the change in the WSCs.

      4.   Postal Service's Unidirectional Measurement of Postmaster Movement

The Commission finds another feature of Proposal Ten to be at least, if not more, problematic as those discussed above. This feature concerns aspects of the EAS system that are not accounted for in the Proposal Ten methodology, namely, the fact

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[48] Jean R Magnus & Andrey L Vasney, "Interpretation and use of sensitivity in econometrics, illustrated with forecast combinations," *International Journal of Forecasting* Vol. 31, Issue No. 3, at 769-81 (2015).

[49] An example of sensitivity analysis when classification and machine learning methods are used in applied economics is Abdelaziz Lawani's Ph.D. dissertation "Three Essays on the Application of Machine Learning Methods in Economics," at 31 (2018), available at *https://uknowledge.uky.edu/cgi/viewcontent.cgi?article=1072&context=agecon_etds.*

that a post office can be downgraded and placed into the EAS grade immediately lower than the one in which the post office currently resides. This occurs if the post office is placed in the lower Zone of Tolerance (ZoT) after its WSCs have fallen below the bottom of what is required for its current grade and has remained in the ZoT for 2 consecutive years. This important feature is missing in the Proposal Ten methodology.

Given that both the existing methodology and Proposal Ten rely on the assumption of proportionality between WSCs and volume, the continuing decrease in Market Dominant volumes could translate, at least partly, into a decline in WSCs. This, in turn, suggests that the downward movement of post offices from the current to a lower EAS grade may not be negligible. Even if the frequency of this event is negligible, the Postal Service has not provided evidence showing that. The information provided by the Postal Service shows that the total WSCs were 136,409,097 in FY 2015, and dropped to 135,313,882 in FY 2016, *i.e.*, by 0.80 percent. *See* Response to CHIR No. 5, question 4.c. However, the Commission recognizes that the change in the aggregate WSCs may not necessarily reflect those in the grade-specific WSCs. As explained in the Bradley Study, "[i]f certain Postmasters are moving from one EAS grade to another, individual EAS grades may see larger changes in WSCs even though the overall total is relatively stable." Bradley Study at 41. For example, the year-over-year growth rate in the aggregate WSCs computed for April 2018 to April 2019 in the report shows negative growth rates for EAS-20 and EAS-21. *Id.* at 42, Table 22. The Commission finds that accounting for the possible movement of post offices from a higher to a lower EAS grade in a pair will make the proposed methodology conform more closely to the functioning of the EAS system. In the modified methodology proposed by the Postal Service, the entire population in the pair of EAS grades is considered in the first classification. The Commission does not have concerns about that because this procedure encompasses the movements from the lower to the higher grade and from the higher to the lower grade in a single combined classification. However, the re-classification step proposed by the Postal Service only considers scaling-up all the WSCs while the downward movement from the higher to the lower EAS grade suggests

that the corresponding change in WSCs should be negative. The Commission finds this feature of the modified proposal unsatisfactory because it does not correctly account for a possible decrease in WSCs. The Commission presents an illustration of what the downward version of the variability would look like in a library reference filed with this Order.[50]

5.   Conclusions

The Commission has raised four main issues with Proposal Ten. Addressing these issues would, in the Commission's view, greatly improve the proposed methodology and, thereby, better reflect the cost-causation principles underlying the Postal Service's costing principles.

The first problem is related to the choice of the WSC percentage change, which is used in Proposal Ten to perform the re-classification of Post Offices and the corresponding percentage change in the cost. The Postal Service's selection of the 10 percent WSC growth rate is excessive when expressed in terms of an equivalent decrease in the probability cutoff points pertaining to the re-classification. The Commission finds the choice procedure referred to by the Postal Service as the sensitivity analysis and the choice criteria used therein imprecise and vulnerable to value judgement. This procedure does not conform to the Postal Service's practice of variability calculation, nor to the general econometric practice, and the Postal Service lacks sufficient historic data to allow for the calculation of a realistic WSC growth rate.

The second problem concerns the specific transformation of the sample used to derive the tallies from the re-classification and, hence, the cost change. The Commission finds that the Postal Service has failed to demonstrate that its assumption of how WSCs change is preferable to other possible alternative assumptions with corresponding transformations of the samples. These alternative assumptions produce

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[50] *See* Library Reference PRC-LR-RM2020-2/4, file "BidirectionalVer.docx."

different re-classification tallies and, hence, different cost changes and variability estimates. The lack of robustness of the variability with respect to the assumed change in WSCs is in the Commission's view a shortcoming of the proposed method.

The third problem concerns the failure of the Postal Service to use clear criteria in its sensitivity analysis that can be relied upon to choose the scaling factor used to implement changes in WSCs.

The fourth problem concerns the unidirectional nature of the proposed variability, which, for each given pair of EAS pay grades underlying a separate logistic regression, only considers possible moves of post offices from the lower to the higher of the two grades. The Commission finds this feature problematic because, as mentioned above, it is possible that a post office may be downgraded from its current EAS grade to the immediately lower pay grade. This possibility occurs if the WSCs of a post office in the higher grade of an EAS grade pair has fallen into the lower ZoT corresponding to the higher grade, and has remained in the ZoT for 2 consecutive years. The unidirectional nature of the proposed method fails to account for an aspect of the EAS system which, in the absence of any evidence to the contrary, the Commission considers as important.

For the reasons stated above, the Commission rejects the changes in analytical principles proposed in Proposal Ten. The Commission finds that the Postal Service failed to show that either the current methodology was significantly inaccurate or that Proposal Ten would result in significant improvement to methodology used to calculate attributable Postmaster costs. 39 U.S.C. § 3652(e)(2).

While the availability of more data creates the opportunity to improve the existing methodology that governs Postmaster cost attribution, the Commission finds that the proposed methodology has several shortcomings, which need serious consideration by the Postal Service. As such, the Commission finds that the overall public interest weighs against accepting a methodology change. *See id.*

The Commission appreciates the Postal Service's effort in updating Postmaster attributable costs. It encourages the Postal Service to consider the Commission's assessment, implement suggested improvements, and resubmit its request.

In the next section, the Commission offers some ideas to help address the shortcomings that it has identified in Proposal Ten. While these are not intended to be prescriptive, future proposals to estimate Postmaster variability should explain why each of the suggested alternatives were or were not utilized.

B.   Two possible modifications to Proposal Ten would improve the existing methodology for attributing Postmaster costs to Postal products.

The Public Representative states that he is unable to present an alternative or alterations to Proposal Ten that would permit Commission acceptance because an appropriate model would need to be developed that could "identify distinct and non-overlapping activities which drive workload or worktime." PR Comments at VII-1. The Commission disagrees and asserts that there are two possible approaches to modifying Proposal Ten that would improve the existing methodology for attributing Postmaster costs.[51]

Each of the two approaches leads to a closed-form expression for computing the variability and does not require a solution to the WSC percentage choice problem. Both methods are based on the logistic regressions using the data pertaining to a pair of successive EAS grades and produce similar results. The first approach relies on purely probabilistic arguments, within the framework of classification and is methodologically closer to Proposal Ten. It is based on the derivation of a large-sample form of Proposal Ten variability. Using calculus analysis avoids the problematic choice of the scaling factor, because the large-sample version of the Proposal Ten variability is further evaluated in the limit when the scaling factor tends to the value 1. In that final form, the

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[51] The two methods are explained in detail in Library Reference PRC-LR-RM2020-2/5, file "A5.docx."

only parameter that appears to be unknown is the probability density of the WSC. This parameter only needs to be estimated at a single point. A kernel estimator is used for the estimation. Because the first approach still uses the first classification leading to the baseline cost, it can be characterized as an approach based on the best prediction of the cost, where the qualifier "best" is used in the sense of the minimization of classification errors.

The second approach takes a geometrical perspective and focuses on the error distance between predicted cost and actual cost. This approach is closer to the Postal Service's practice in variability calculations used for other cost segments. The first step is to calculate the best prediction of the cost based on the estimated probabilities. The term "best" is employed in this case to refer to the minimization of the error distance between the predicted cost and the actual cost, hence the characterization of the approach as geometrical. The elasticity of the best prediction of the cost is then derived using calculus. The second approach therefore does not involve any classification.

These two suggested approaches avoid the need to make assumptions about the direction and magnitude of changes in WSCs. They also lead to variabilities that, for each EAS grade pair, do not vary with the direction in which post offices may move from one EAS grade to the other (from lower to higher or from higher to lower).

The variabilities produced by these two methods are displayed in Table 6, along with the variabilities produced by Proposal Ten with a 2.5 percent and 10 percent WSC increase.[52]

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[52] Additional details of the results are presented and discussed in Library Reference PRC-LR-RM2020-2/5, file "A5.docx."

Table 6
Variabilities Produced by Proposal Ten and by
Using from the Suggested Alternative Approaches

Regression	Alternative Approaches		Proposal Ten	
	Large Sample	Geometrical	2.5 Percent WSC Increase	Proposal Ten, 10 Percent WSC Increase
EAS-18 to EAS-18B	4.95%	4.83%	8.10%	8.90%
EAS-18B to EAS-20	5.37%	5.33%	5.60%	6.90%
EAS-20 to EAS-21	4.79%	4.77%	5.70%	6.50%
EAS-21 to EAS-22	2.11%	2.05%	2.20%	2.90%
EAS-22 to EAS-24	5.62%	5.38%	5.00%	6.10%
EAS-24 to EAS-26	9.89%	8.04%	3.40%	11.90%

Sources: PRC-LR-2020-2/5, file "A5.docx," Tables 1 and 2; Bradley Study at 43, Table 23.

VII. ORDERING PARAGRAPH

It is ordered:

For purposes of periodic reporting to the Commission, the Postal Service's
Proposal Ten is rejected.

By the Commission.

Erica A. Barker
Secretary